AAS ADVANCED ANESTHESIA SPECIALISTS

DARVALL

We Warm Animals

User Manual For

Warm Inspired Air Control Unit

to use with

Darvall Heated Smooth-Wall Circuits
or
Darvall Heated ZDS Qubes

For Veterinary Use Only

Warm Inspired Air Control Unit

Use for Veterinary Anesthesia

with

Darvall Heated Smooth-Wall Circuits (HBC)

On Circle Systems for Cats, Dogs and other small animals up to 80Kgs

or

Darvall Heated ZDS Qubes

A Non-Rebreathing System for Rodents, Birds, Exotics, Reptiles, Pups and Kittens

For Veterinary Use Only
Not intended or approved for Human Medical purposes
Not evaluated to Human Medical Standards

Evaluated By MET Laboratories to IEC / EN 61010-1
Electrical equipment for measurement, control, and laboratory use

User Manual Contents

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Introduction

Maintaining anaesthesia in small animal veterinary practice is most commonly achieved using inhalation of volatile vapour ("anaesthetic gas"), typically isoflurane. The anaesthetic gas is generally delivered by flowing oxygen through a vaporiser, to a breathing system which is connected to the animal via flexible plastic tubing (breathing hoses).

The breathing hoses are replaced on a daily basis to permit cleaning. Most commonly in dogs and cats, unconsciousness is induced by using a short acting intravenous anaesthetic, then an endo-tracheal tube is placed into the animal's airway and sealed to make a gas tight connection with the anaesthetic breathing system. This means that the animal's nose has been by-passed. The inspired gas, usually at room temperature (20°C to 22°C in surgery rooms) must be warmed to body temperature = 38°C and 100% humidified before reaching the lungs. Expired gas temperature and humidity, usually recovered by the nose, are lost to the expired limb of the anaesthetic breathing system, so small animals become cold (hypothermic) during anaesthesia which results in longer recovery and increased anaesthesia mortality compared to normo-thermic animals.

AAS Heated breathing circuits warm the inspired anaesthetic gas close to body temperature (38 °C) for small animals. This may be useful in reducing heat loss and pulmonary flow resistance, and avoiding bronchospasm and laryngospasm due to the inspiration of cold gas.in asthmatic animals. We have developed 2 two principle devices for the broadly similar purpose of warming inspired anaesthetic gas, depending on the animal's size and the practicalities of intubation. These are the Heated Breathing Tube, and the Qube®.

The Heated Breathing Tube is designed for anaesthesia of small animals (e.g. dogs, cats, rabbits etc.) where the inhalant anaesthetic is typically delivered via an endo-tracheal tube from a circle breathing system
The Qube is designed for anaesthesia of very small animals including rodents (mice, rats, gerbils etc.), birds, reptiles and other exotic species such as found in zoological parks, where intubation may not be possible or practical.

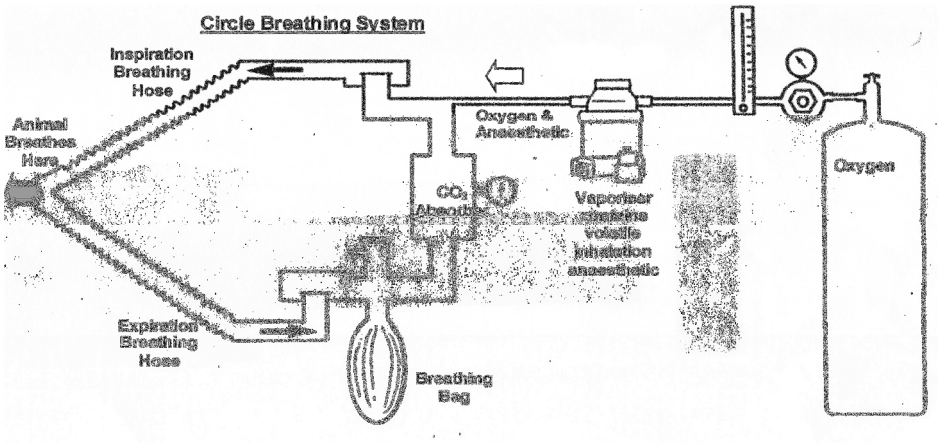

Figure 1 Diagram of an anaesthetic machine with a circle breathing system

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1. Heated Breathing Tube

Heated breathing tubes are novel devices (AAS Patent Applied for 2011), designed for anaesthesia of small animals (e.g. dogs, cats, rabbits etc.) where the inhalant anaesthetic is typically delivered via an endo-tracheal tube from a circle breathing system (Figure 1)

The inspired gas is warmed by passage through an inspiratory heated breathing tube. Advanced Anaesthesia Specialists (AAS) produces 2 sizes of heated breathing tubes designed for animals: 12mmID or 16mmID and both 1.5m long (breathing tubes used in anaesthesia of adult humans are typically 20mmID).

The AAS tubes include a heating wire embedded in the wall of the tube spirally extending along the length of the tube. In addition, at the endotracheal end of the breathing tube a temperature sensor extends radially into gas stream. This heated breathing tube is supplied thermostatically controlled power via a 4 conductor cable by the HBC control unit.

2. Qube® - Heated Anaesthesia Block

Heated rodent anaesthesia blocks (Registered trademark Qube) are novel devices (AAS Patent Application lodged 2010) designed for anaesthesia of very small animals including rodents (mice, rats, gerbils etc), birds, reptiles and other exotic species such as found in zoological parks, where intubation may not be possible or practical. In this case the inhalant anaesthetic is delivered via a sealed, zero dead space face mask (place over the animal's nose or beak) which is connected to an anaesthetic gas delivery block which can be heated to warm the inspired gas (Figure 2)

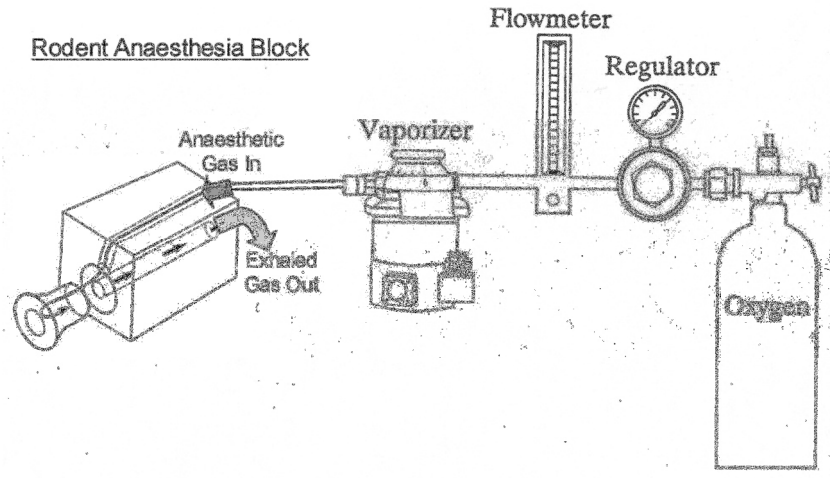

Figure 2 Diagram of a Heated Rodent Anaesthesia Block connected to an anaesthetic machine

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The AAS Qube block (50 x 50 x 70 mm, 0.25 kg), is warmed by two embedded thermostatically controlled heater elements from power supplied by the Heated Breathing Circuit controller. Anaesthetic gas is fed to a barbed input port and passes along a warming path through the block. The warmed gas is delivered to the mask connection port to then be inhaled by the animal. There are a range of Qube mask sizes and shapes available for specific species and applications (see ZDS Qube Mask). Exhaled gas exits via a second port into a waste gas removal tube.

3. Heated Breathing Circuit controller

a) Description

The Heated Breathing Circuit controller is an embedded microprocessor based system with the following functionality:

1) Monitoring the Heated Breathing Tube or Qube temperature close to the animals' airway and continuously report the temperatures to the HBC display and an attached (via USB) computer
2) Control the heating power to the Heated Breathing Tube or Qube
3) Detect over temperature, disable further heating and report the condition to the HBC display and an attached (via USB) computer
4) Detect sensor error conditions and report the condition to the HBC display and an attached (via USB) computer
5) Allow an auxiliary temperature to be measured from an additional sensor which may report on animal core temperature or exhalation temperature as required. Continuously report the auxiliary temperatures to the HBC display and an attached (via USB) computer
6) Display the temperature in Celsius or Fahrenheit (selectable) on an LED display
7) Operate both with a USB attached computer and autonomously in Stand-alone mode

b) Connecting up the controller

The controller is designed with flexibility of use in mind and can be connected up in a number of different ways.

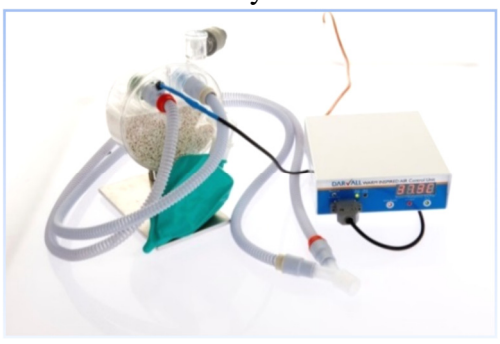

Figure 3 Darvall Heated Breathing Circuit Controller connected to a Darvall Smooth-Wall heated breathing circuit. The inspiratory limb of the circle system is connected to the Heated Breathing Circuit Controller at the canister end of the inspiratory tube. The animal end of this tube has an imbedded temperature sensor to monitor the temperature of the inspired gas.

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c) Stand-alone heated tube

A power plug (IEC) is connected to the rear of the unit and a D15 plug is connected between the front of the unit and the heater tube. (Figure 3). The anaesthetic gas circuit is connected in the required configuration.

d) Computer monitored heated tube

Connected as with Stand-alone (a) and add a USB connection from the controller (on right hand side, side panel) to the computer. The AAS HBC software will detect the connection automatically.
Note also that when connected to a computer and no mains power is present at the IEC socket, the controller will operate in all monitoring ad data logging modes, but no heating will be available. This condition will be reported with a special error code to the computer.

e) Auxiliary temperature monitoring

An additional sensor may be plugged into the auxiliary jack socket on the controller's front panel (in addition to connections in (a) and (b) above). Which sensor being monitored on the LED display on the controller's front panel is indicated by the two LEDs near the D15 socket on the front panel.
Note If there is no heater element (tube) present, the auxiliary temperature may still be monitored.

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4. ZDS Qube connections

The Qube heating block may be used in place of the heated tube. The electrical connections are similar to those described in (a), (b) and (c) above except that the D15 cable has a 4-pin mini XLR plug on the end which goes into the Qube.

Figure 4 Shows 2 ZDS Qube. The ZDS Qube block on left shows rodent in a mask being monitored by an auxiliary temperature probe. The ZDS Qube block in the centre is connected to the Heated Breathing Circuit controller which provides power and monitors the temperature of the block. The HBC controller is on the right.

Figure 5 Close up of the ZDS Qube block. The Red light shows that heating is on. In this picture the gas ports are not connected to the anaesthetic gas delivery machine (small top port is anaesthetic gas in; the large bottom port is waste anaesthetic gas out)

contents

5. Safety Features of the HBC system

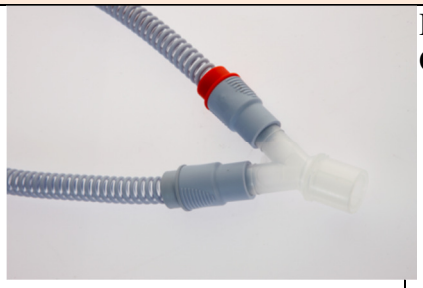
1) Modern anaesthetic vapour agents are "generally regarded as non-flammable during clinical anaesthesia" The heating elements of the HBC system are designed to never contact the anaesthetic gas; (indirect heating), eliminating electrical fault conditions as an ignition source to the gas.
2) The HBC system maintains electrical isolation between the animal and conductive surfaces in the system.
3) The temperature monitoring sensor close to the animal prevents thermal damage to the airway.
4) An over safe operating temperature condition will cause an alarm and disable further heating

6. Specifications

Power source	100-250V AC mains
Power connector	IEC C13 connector with integral switch and fuse allowing IEC C13 cables with international plug varieties
Internal Power supply	75W Switch Mode Power Supply fixed 24V DC output unit is enclosed metal frame type with UL certification and CE mark
Controller	Single printed circuit board with all control components. Input voltage 24V logic operating voltage 5V
Enclosure	Purpose built all steel construction in two parts – both parts with earth link. Top half with narrow ventilation slits - lower half contains solid barrier to prevent contact with mains through ventilation slits
Heating voltage	24V
Temperature Sensor	thermistor

contents

7. Parts for replacement and consumables

Part Number	Photo	Description
Controller Parts		
8445		Heated Breathing Circuit controller ONLY
Aus/NZ - 8970 UK – 8971 US - 8998 EU – 8999		IEC mains cable with regional appropriate plug
8968		USB cable (USB A to USB mini B plugs)
Heated Breathing Circuit Parts		
2-20kg – 8347 20-80kg – 8348		Heated Breathing Circuits
8615		Cable HBC to breathing tube (15 pin D connector to 4pin block)

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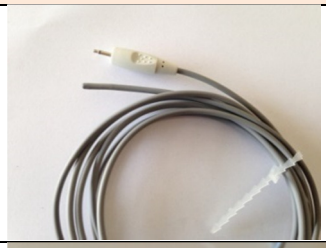
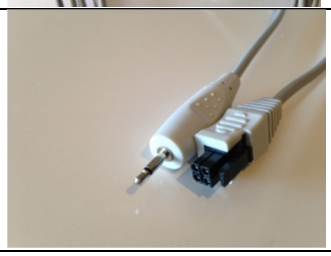
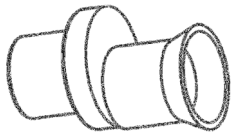
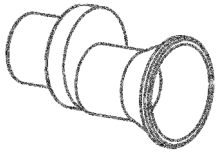
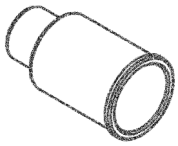
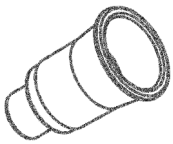
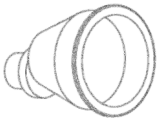
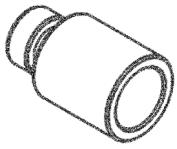
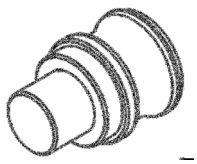
Qube Parts		
Qube ONLY – 8270 Qube + Rodent Masks – 8437 Qube + Exotics Masks – 8457		Heated Qube
8619		Cable HBC to Qube (15 pin D connector to 4pin mini XLR)
Auxiliary temperature measurement Parts		
4.0mm Cat/Dog – 8617 3.2mm Rodent – 8618		Auxiliary temperature probe
8616		Auxiliary Expiratory tube cable

contents

8. ZDS Qube Mask Sizes

Part #	Description	Application	Diagram
8382	ZDS Qube Mask 15mm Offset Tapered White Acetal	Shortened 20mm offset mouse facemask specifically for stereotaxic block Typical Species:- Mouse	
8416	ZDS Qube Mask 20mm Offset Tapered	3/4"/20mm offset tapered. Supplied with two 20mmOD - 0.3"/8mm ID aperture diaphragms Typical Species:- Mouse	
8415	ZDS Qube Mask 20mm Straight	3/4"/20 mm straight. Supplied with two 20mm OD - 0.3"/8mm ID aperture diaphragms (#8334) Typical Species:- Small Rat	
8414	ZDS Qube Mask 25mm Tapered	1"/25 mm tapered. Supplied with two 25mm OD - 1/2"/12mm ID aperture diaphragms (#8335) Typical Species:- Large Rat	
8413	ZDS Qube Mask 40mm/1.5" offset tapered	1.5"/40mm tapered, offset - supplied with one silicon diaphragm with 3/4"/20mm aperture Typical Species:- Rabbit / Ferret	
8420	ZDS Qube Mask 15mm Tapered Endotracheal Tube Adaptor	- for use with all standard ET tubes (0.6"/15mm ID) Typical Species:- Mouse	
8381	ZDS Qube Mask Blanking Plug Black Acetal	Sealed off blanking plug for use on 5 station manifold when stations are not in use.	

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Trademarks

Darvall is a registered trademark of Advanced Anaesthesia Specialists Pty

ZDS Qube is a trademark pending of Advanced Anaesthesia Specialists Pty

Information contained in this publication regarding device application is intended through suggestion only. It is the user's responsibility to ensure that the equipment discussed in this document meet the needs of your requirement. It is the user's responsibility to operate the equipment in a safe manner.

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